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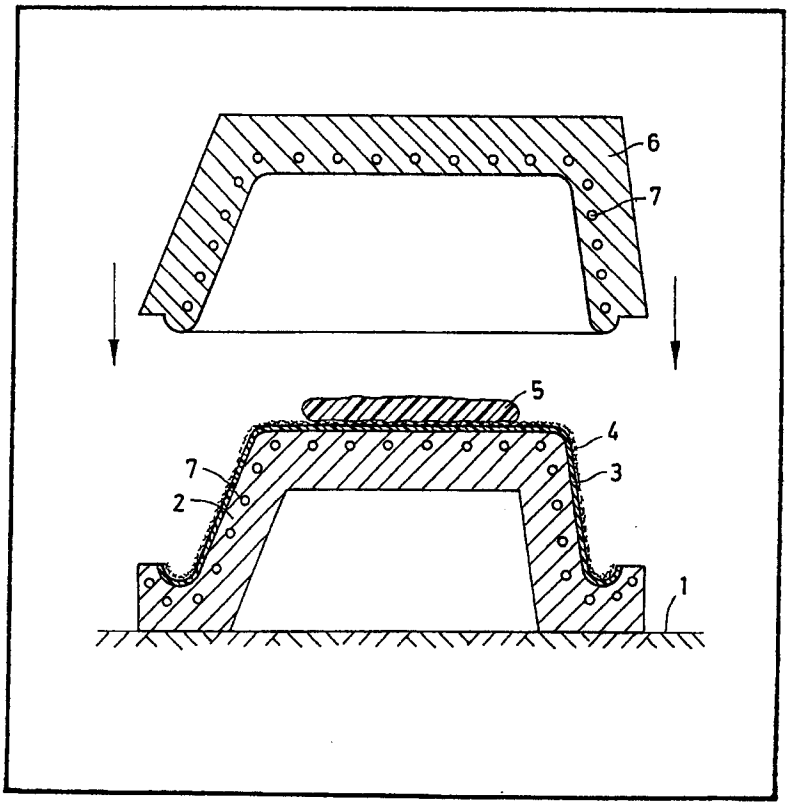
(71) Applicant
Eberhard Hoesch & Söhne
Kunststoffwerk KG.
Postfach 5 50, D-5160
Düren, Germany
(72) Inventor
Helmut Brandes
(74) Agent
Lloyd Wise, Tregear & Co

(54) Producing Reinforced Containers

(57) A container e.g. sanitary ware is reinforced by inverting a container inner wall portion 3 over a die 2 which closely abuts the inner surface of the container portion. A layer of fibre material 4 is placed on the outer surface of the container portion 3 either before or after the container portion is inverted over the die 2. A quantity of curable liquid plastics material 5 is placed on at least one point of the fibre layer and the resulting article is hot pressed between the die and a mould 6 whose moulding surface conforms in shape to the outer surface of the finished container. The quantity of plastics material used is approximately equal in volume to the finished reinforcing layer. The moulding pressure is applied until the reinforcing layer is sufficiently hardened to allow the article to be removed from the die without deformation and the die is heated or cooled by passing a heat transfer medium through tubes 7.



The drawing originally filed was informal and the print here reproduced is taken from a later filed formal copy.

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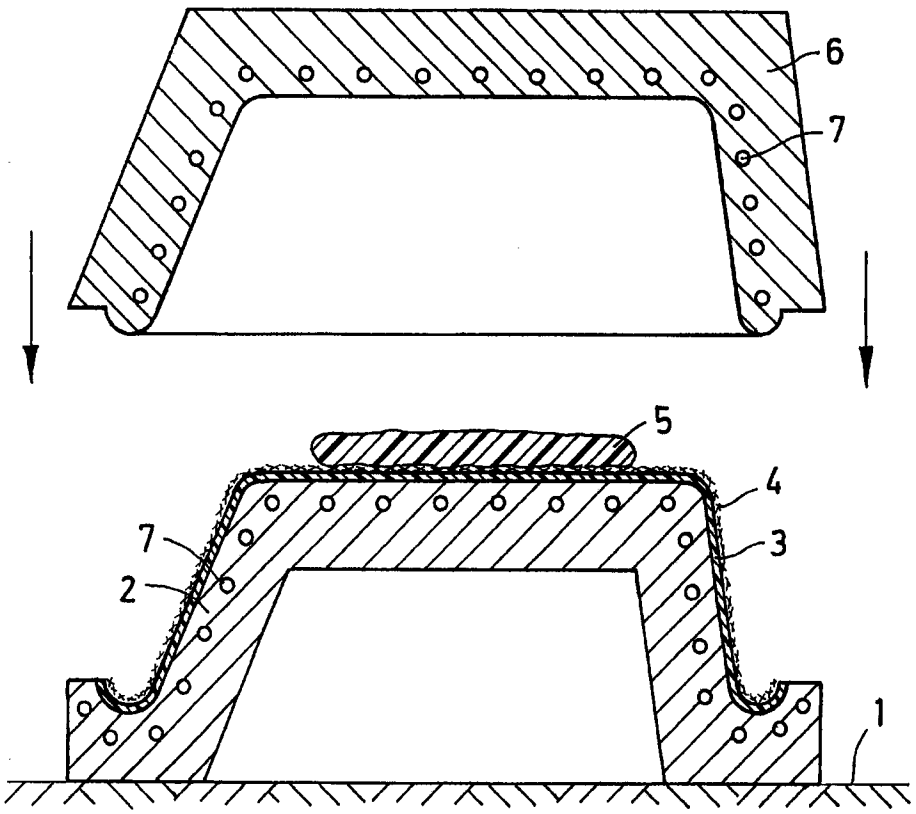
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SPECIFICATION

Process for the Production of Open Containers

The invention relates to a process for the production of open containers, more particularly sanitary articles such as bath tubs or the like, wherein a deep-drawn container portion forming the inner wall of the container and preferably consisting of a methyl methacrylate polymer is provided, on its outer surface which forms the outer wall, with a reinforcing layer comprising plastics material containing a fibre material.

Hitherto, in the production of bath tubs, shower basins or the like from a methyl methacrylate polymer, the desired basic form has first been produced from a sheet of methyl methacrylate polymer by deep drawing. The deep-drawn material is generally very glossy and dyed throughout. The deep-drawing process produces a container portion which forms the inner wall after it is finished. The wall thickness of this container part is not, however, adequate from the point of view of strength, which means that this part has to be provided with a reinforcing layer from the outside. Hitherto, this has been effected by a spraying operation in which a curable plastics material, particularly synthetic resin, was sprayed on manually. The fibre material required for reinforcement which has to be embedded in the plastics layer is fed in filament form into the spray gun in which it is chopped into short lengths and from which it is sprayed on to the container portion together with the plastics material. Thereafter, the sprayed on fibre and plastics layer is rolled out by hand, particularly in contoured regions e.g. grooves and curves so as ultimately to obtain a correspondingly shaped solidified fibre reinforced layer. The container is then placed in a heating zone in order to cure the plastics material of the applied layer. Even for an experienced person, it is impossible, when applying the reinforcing layer manually, to apply it in such a way that the deep-drawn container portion is coated, on the surface requiring coating, with a reinforcing layer of different thickness in different areas, as may be required for its stability. Moreover, this process is very labour-intensive and also time-consuming, since, with respect to the person operating the spraying equipment, the plastics mixture must be of a composition such that it only cures slowly, with the result that the heating zone also has to be of correspondingly large size in order to ensure a sufficient residence time.

According to the present invention a process for the production of an open container is provided in which a container portion forming the inner wall of the container is provided, on its outer surface with a reinforcing layer comprising a plastics material containing a fibre material, wherein the container portion is inverted over a moulding die abutting closely on its inner contour, the outer surface of the container portion is at least partially covered with at least one layer of fibre material, a quantity of a curable plastics material corresponding approximately to the volume of the finished reinforcing layer is applied in the liquid state to at least one point on the fibre layer covered surface of the container portion the resulting article being pressed between the die and a mould having a moulding surface conforming in shape to the desired outer shape of the finished container, the pressure being maintained throughout at least partial curing of the plastics material and the pressing mould and/or the moulding die being supplied with a heat transfer medium at least during the at least partial curing in order to control the progress of the n ring reaction.

Preferred methods in accordance with the invention have the advantage that, on the one hand, because of the fixed dimensions of the pressing mould which corresponds to the outer contour of the desired article and, on the other hand, because of the arrangement of the moulding die which carries the pre-formed container portion, it is possible to obtain a uniform, reproducible wall thickness. In addition, it is also possible to include deliberate variations in wall thickness in the moulding operation, and this can be achieved by means of corresponding recesses in the pressing mould. It is also possible to introduce more fibre material in such regions which are to be reinforced, so as to increase the strength in these regions. A further advantage is that, after the plastics material has been applied and moulded on, no further surface treatment need be carried out, as, provided that the surface quality of the pressing mould is satisfactory, the same surface quality is obtained on the reinforcing layer which is to be applied. As the pre-formed container portion abuts closely on the moulding die, damage to the surface of the inner wall of the container is avoidable. This is of particular importance in bath tubs, since the inner wall of the container will later be the surface in use, and thus has to be visually satisfactory. Another advantage of preferred processes in accordance with the invention is that the reinforcing layer can be applied in a very much shorter time, with the result that it is thus possible to use a plastics material which reacts much more quickly and hardens during the moulding operation at least sufficiently to give the desired stability of form so that the finished, coated container merely has to be moved into an heating chamber to complete the curing process. It is moreover, possible, by supplying heat to the pressing mould and/or to the moulding die at the beginning of the moulding operation, via a heat transfer medium, to initiate the reaction as quickly as possible, after which some of the heat of reaction can be removed by means of a heat-transfer medium. Removal of the heat of the reaction is particularly important when processing container portions made of a methyl methacrylate polymer, since the surface quality of the inner wall is impaired if the reaction heat is too great. The application of the plastics layer is also simplified considerably, since the required amount of

plastics material is simply applied, suitably metered, in batches at one or more points and its distribution over the entire outer surface is effected by the application of the pressing mould.

In an advantageous embodiment of the invention, it is proposed that the required quantity of plastics be applied to the region which is highest in relation to the edge of the container portion inverted over the moulding die. Since the plastics material is applied in liquid form, this makes use of the fact that the plastics material is applied to the part which will later form the base and which is exposed to the greatest pressure during the moulding operation, so that distribution of the plastics material into the region of the rim is ensured and at the same time the penetration into edge areas is also promoted by gravity to some extent. In a particularly advantageous embodiment of the process according to the invention, the plastics material is applied to the container portion in such a way that substantially identical flow paths to the edge of the container are produced. This means that, in the case of a container of elongate form, for example, a bath tub, the plastics material is applied in a correspondingly elongate form to the uppermost part of the base of the pre-formed container portion, whereas, in the case of a square or round container portion, such as a shower basin, or a large, roughly circular bath tub, the plastics material is applied in the form of a round 'cake' to the upper part of the base portion.

In another advantageous embodiment of the invention, it is proposed that the fibrous material be applied to the container portion after previously being shaped to match its form. It is possible to use either a woven fibre material or a matted fibre material. The advantage of this mode of operation is, in particular, that in addition to a homogeneous and predetermined distribution of the plastics mixture, a predetermined distribution of the fibre material is obtainable. In the practice of the last mentioned embodiment the pre-formed container portion is first placed on the moulding die and then a correspondingly pre-shaped fibre placed on the container portion to cover it, the pre-shaped form ensures that the fibre material abuts uniformly on the outer surface of the pre-formed container portion which is to be coated with the plastics material. Only then is the plastics material applied and distributed by the moulding operation, whereby the fibre material is embedded in the plastics material and at the same time the plastics material is bonded to the material of the pre-formed container portion. However, the fibre material must be such that it not only has the required strength but also allows the plastic material to flow therethrough during the pressing operation.

The use of a matted fibre material also opens up the possibility of applying fibre material in the form of sections cut off from a roll of such material, on the pre-formed container portion in correct alignment with the contours of the container before the application of the plastics material. The deformability of a matted fibre material, even in the direction of the plane of the material, facilitates this operation.

The progress of a preferred procedure in accordance with the invention is explained more fully, by way of example only, with reference to the drawing which is a schematic view of a section through an apparatus for the production of a bath tub. In this apparatus, a moulding die 2 is attached to a base plate 1, the outer contour of the die 2 corresponding to the contour of the inner wall of a bath tub. On this moulding die is placed a bath tub component 3 pre-formed by deep-drawing and consisting of a methyl methacrylate polymer, for example. The deep-drawn component 3 here abuts on the moulding die 2 at all points. On its outside the deep-drawn component 3 is covered with fibre material 4 which may, for example, consist of a pre-shaped piece of textile material, i.e. a piece of woven material which corresponds in form to the outer contour of the deep-drawn component 3 and which is inverted over the deep-drawn component 3. The application of pre-shaped fibre material of this kind may take place outside the press, so that the deep-drawn component 3 with the fibre material already placed over it is inverted over the moulding die. Subsequently, a metering device (not shown) applies the required amount of a plastics mixture to that area of the deep-drawn component 3 covered with the fibre material 4 which forms the base of the bath tub, and the mixture is applied in the form of an elongate cake 5. Immediately afterwards, a pressing mould 6 is lowered on and is applied to the moulding die 2 and the deep-drawn component 3 inverted thereon, under pressure. The pressing mould 6 is guided in a machine frame (not shown) which is provided with a preferably hydraulic pressing means acting on the pressing mould 6. As a result, the liquid cake of plastics material is evenly distributed in all directions, permeates through the fibre material and thus becomes bonded to the outer surface of the deep-drawn component 3, whilst the deep-drawn component 3 is thus coated to the intended wall thickness. By providing recesses (not shown) in the pressing mould 6, thickened areas can be produced at desired regions in the plastics coating. The pressure of the pressing mould 6 is maintained for a predetermined reaction time, that is until the plastics layer applied has hardened sufficiently to allow the now coated bath tub to be removed from the moulding die 2 without any deformations and taken away for further curing and cooling.

By means of pipe systems 7 shown in the moulding die 2 and in the pressing mould 6, a heat-transfer medium can then be fed through the die 2 or mould 6 thereby to pre-heat both parts and to supply additional heat to the parts immediately after the pressing operation, if desired, in order to initiate the curing reaction in the plastics material. However, as soon as the reaction is proceeding, the heat generated in the

course of the reaction can be removed by the same or another heat transfer medium, i.e. the moulding die and pressing mould can be cooled; this may be desirable in order to avoid changes in the form or structure of the deep-drawn component 3.

The plastics or synthetic resin material must have a certain viscosity, depending on the shape of the container, so as not to run away too quickly, but yet run quickly enough so that it spreads where required during the brief period of closing of the die and mould. The temperature of the tool should be controlled so that, on the one hand, a short reaction time is obtained and thus a higher production rate, but on the other hand the temperature should not be so high that the plastics shell 3 which may be quite delicate is damaged.

Appropriately, distribution channels may be provided in the pressing mould so that, even if the application of the plastics material is not optimal, the material flows into the remotest corners and edges during the pressing operation. In the case of a bath tub, for example, the plastics material has to run back up in the region of a curved round rim.

Claims

1. A process for the production of an open container in which a container portion forming the inner wall of the container is provided on its outer surface with a reinforcing layer comprising a plastics material containing a fibre material, wherein the container portion is inverted over a moulding die abutting closely on its inner contour, the outer surface of the container portion is at least partially covered with at least one layer fibre material, a quantity of curable plastics material corresponding approximately to the volume of the finished reinforcing layer is applied in the liquid state to at least one point on the fibre layer covered surface of the container portion, the resulting article being pressed between the die and a mould having a moulding surface conforming in shape to the desired outer shape of the finished container, the pressure being maintained throughout at least partial curing of the plastics material and the pressing mould and/or the moulding die being supplied with a heat transfer medium at least during the at least partial curing in order to control the progress of the curing reaction.

2. A process according to Claim 1, wherein the container portion is of thermoplastics material.

3. A process according to Claim 2, wherein the thermoplastic material is polymethyl methacrylate.

4. A process according to any one of the preceding claims, wherein the required quantity of said plastics material is applied to the highest region in relation to the edge of the container portion inverted over the moulding die.

5. A process according to Claim 4, wherein the quantity of said plastics material is applied to the container portion in such a way that similar paths of flow of the material to the edge of the container are produced.

6. A process according to any one of Claims 1 to 5, wherein the fibre material is applied to the container portion after being pre-shaped.

7. A process according to any one of Claims 1 to 6, wherein a woven fibre material is used.

8. A process according to any one of Claims 1 to 6, wherein a matted fibre material is used.

9. A process according to any one of the preceding claims, wherein the container portion has been produced by deep-drawing.

10. A process according to any one of the preceding claims, wherein the finished container is a sanitary article.

11. A process according to Claim 10, wherein the sanitary article is a bath tub.

12. A process for the production of an open container, substantially as described herein with reference to the drawing.

13. A container produced by the process of any one of the preceding claims.

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